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FAIRCHILD SEMICONDUCTOR™

August 1986
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# DM74LS244
# Octal 3-STATE Buffer/Line Driver/Line Receiver

## General Description

These buffers/line drivers are designed to improve both the performance and PC board density of 3-STATE buffers/drivers employed as memory-address drivers, clock drivers, and bus-oriented transmitters/receivers. Featuring 400 mV of hysteresis at each low current PNP data line input, they provide improved noise rejection and high fanout outputs and can be used to drive terminated lines down to 133Ω.

## Features

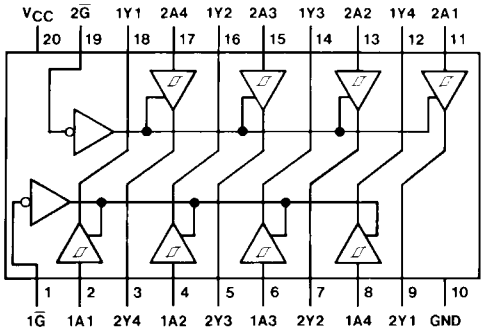
- 3-STATE outputs drive bus lines directly
- PNP inputs reduce DC loading on bus lines
- Hysteresis at data inputs improves noise margins
- Typical $I_{OL}$ (sink current) 24 mA
- Typical $I_{OH}$ (source current) −15 mA
- Typical propagation delay times
  - Inverting 10.5 ns
  - Noninverting 12 ns
- Typical enable/disable time 18 ns
- Typical power dissipation (enabled)
  - Inverting 130 mW
  - Noninverting 135 mW

## Ordering Code:

| Order Number | Package Number | Package Description |
|---|---|---|
| DM74LS244WM | M20B | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| DM74LS244SJ | M20D | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| DM74LS244N | N20A | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

## Connection Diagram




## Function Table

| Inputs | | Output |
|---|---|---|
| $\overline{G}$ | A | Y |
| L | L | L |
| L | H | H |
| H | X | Z |

L = LOW Logic Level
H = HIGH Logic Level
X = Either LOW or HIGH Logic Level
Z = High Impedance

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## Absolute Maximum Ratings(Note 1)

| | |
|---|---|
| Supply Voltage | 7V |
| Input Voltage | 7V |
| Operating Free Air Temperature Range | 0°C to +70°C |
| Storage Temperature Range | −65°C to +150°C |

**Note 1:** The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

## Recommended Operating Conditions

| Symbol | Parameter | Min | Nom | Max | Units |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | 4.75 | 5 | 5.25 | V |
| $V_{IH}$ | HIGH Level Input Voltage | 2 | | | V |
| $V_{IL}$ | LOW Level Input Voltage | | | 0.8 | V |
| $I_{OH}$ | HIGH Level Output Current | | | −15 | mA |
| $I_{OL}$ | LOW Level Output Current | | | 24 | mA |
| $T_A$ | Free Air Operating Temperature | 0 | | 70 | °C |

## Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

| Symbol | Parameter | Conditions | | Min | Typ (Note 2) | Max | Units |
|---|---|---|---|---|---|---|---|
| $V_I$ | Input Clamp Voltage | $V_{CC}$ = Min, $I_I$ = −18 mA | | | | −1.5 | V |
| HYS | Hysteresis ($V_{T+} - V_{T-}$) Data Inputs Only | $V_{CC}$ = Min | | 0.2 | 0.4 | | V |
| $V_{OH}$ | HIGH Level Output Voltage | $V_{CC}$ = Min, $V_{IH}$ = Min<br>$V_{IL}$ = Max, $I_{OH}$ = −1 mA | | 2.7 | | | V |
| | | $V_{CC}$ = Min, $V_{IH}$ = Min<br>$V_{IL}$ = Max, $I_{OH}$ = −3 mA | | 2.4 | 3.4 | | |
| | | $V_{CC}$ = Min, $V_{IH}$ = Min<br>$V_{IL}$ = 0.5V, $I_{OH}$ = Max | | 2 | | | |
| $V_{OL}$ | LOW Level Output Voltage | $V_{CC}$ = Min<br>$V_{IL}$ = Max<br>$V_{IH}$ = Min | $I_{OL}$ = 12 mA | | | 0.4 | V |
| | | | $I_{OL}$ = Max | | | 0.5 | |
| $I_{OZH}$ | Off-State Output Current, HIGH Level Voltage Applied | $V_{CC}$ = Max<br>$V_{IL}$ = Max<br>$V_{IH}$ = Min | $V_O$ = 2.7V | | | 20 | µA |
| $I_{OZL}$ | Off-State Output Current, LOW Level Voltage Applied | | $V_O$ = 0.4V | | | −20 | µA |
| $I_I$ | Input Current at Maximum Input Voltage | $V_{CC}$ = Max | $V_I$ = 7V | | | 0.1 | mA |
| $I_{IH}$ | HIGH Level Input Current | $V_{CC}$ = Max | $V_I$ = 2.7V | | | 20 | µA |
| $I_{IL}$ | LOW Level Input Current | $V_{CC}$ = Max | $V_I$ = 0.4V | −0.5 | | −200 | µA |
| $I_{OS}$ | Short Circuit Output Current | $V_{CC}$ = Max (Note 3) | | −40 | | −225 | mA |
| $I_{CC}$ | Supply Current | $V_{CC}$ = Max, Outputs Open | Outputs HIGH | | 13 | 23 | mA |
| | | | Outputs LOW | | 27 | 46 | |
| | | | Outputs Disabled | | 32 | 54 | |

**Note 2:** All typicals are at $V_{CC}$ = 5V, $T_A$ = 25°C.

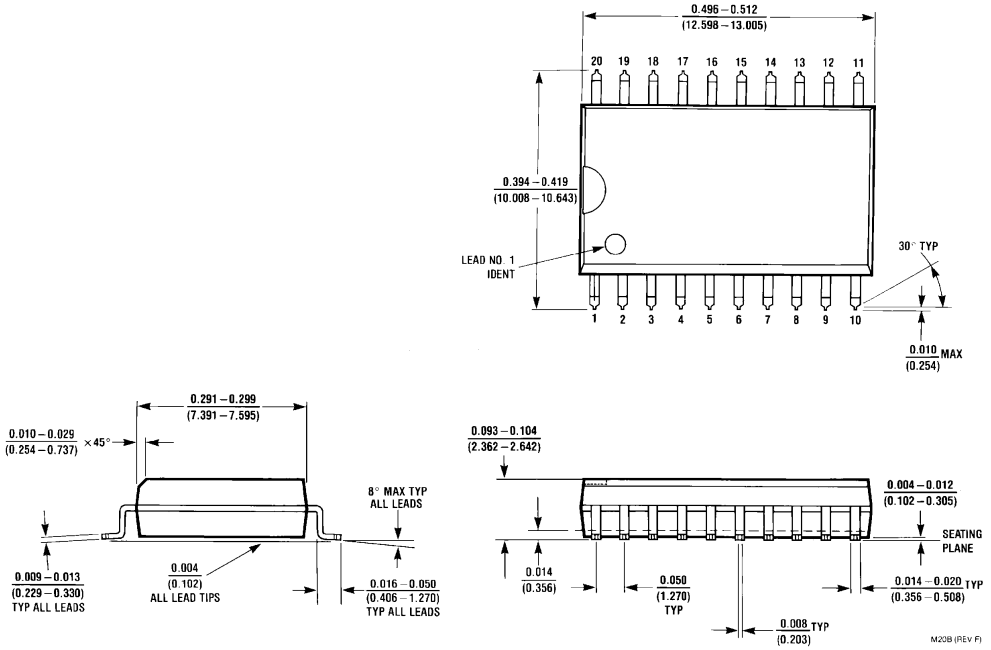
**Note 3:** Not more than one output should be shorted at a time, and the duration should not exceed one second.

## Switching Characteristics

at $V_{CC}$ = 5V, $T_A$ = 25°C

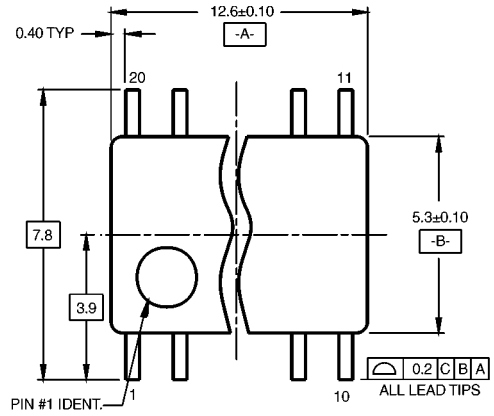
| Symbol | Parameter | Conditions | Max | Units |
|---|---|---|---|---|
| $t_{PLH}$ | Propagation Delay Time<br>LOW-to-HIGH Level Output | $C_L$ = 45 pF<br>$R_L$ = 667Ω | 18 | ns |
| $t_{PHL}$ | Propagation Delay Time<br>HIGH-to-LOW Level Output | $C_L$ = 45 pF<br>$R_L$ = 667Ω | 18 | ns |
| $t_{PZL}$ | Output Enable Time to<br>LOW Level | $C_L$ = 45 pF<br>$R_L$ = 667Ω | 30 | ns |
| $t_{PZH}$ | Output Enable Time to<br>HIGH Level | $C_L$ = 45 pF<br>$R_L$ = 667Ω | 23 | ns |
| $t_{PLZ}$ | Output Disable Time<br>from LOW Level | $C_L$ = 5 pF<br>$R_L$ = 667Ω | 25 | ns |
| $t_{PHZ}$ | Output Disable Time<br>from HIGH Level | $C_L$ = 5 pF<br>$R_L$ = 667Ω | 18 | ns |
| $t_{PLH}$ | Propagation Delay Time<br>LOW-to-HIGH Level Output | $C_L$ = 150 pF<br>$R_L$ = 667Ω | 21 | ns |
| $t_{PHL}$ | Propagation Delay Time<br>HIGH-to-LOW Level Output | $C_L$ = 150 pF<br>$R_L$ = 667Ω | 22 | ns |
| $t_{PZL}$ | Output Enable Time to<br>LOW Level | $C_L$ = 150 pF<br>$R_L$ = 667Ω | 33 | ns |
| $t_{PZH}$ | Output Enable Time to<br>HIGH Level | $C_L$ = 150 pF<br>$R_L$ = 667Ω | 26 | ns |

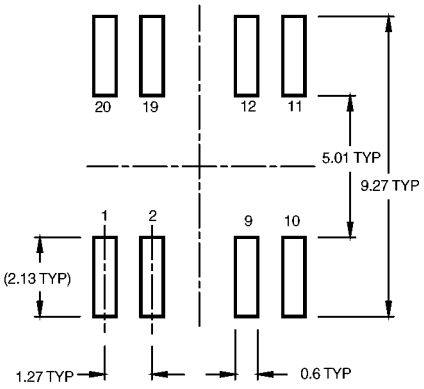
## Physical Dimensions inches (millimeters) unless otherwise noted



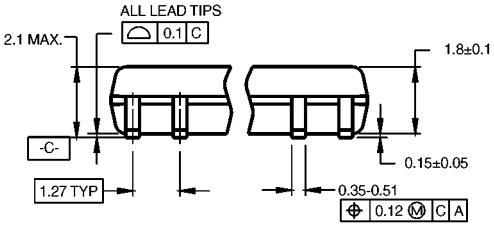

**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide**
**Package Number M20B**

## Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

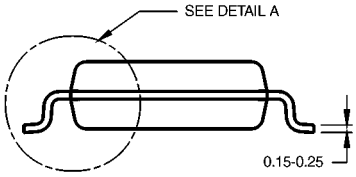



LAND PATTERN RECOMMENDATION




DIMENSIONS ARE IN MILLIMETERS



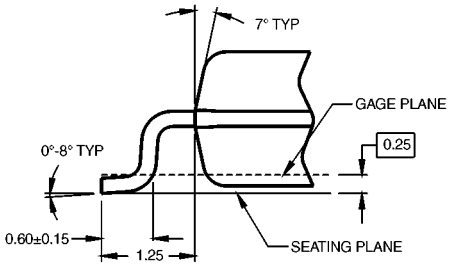

NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

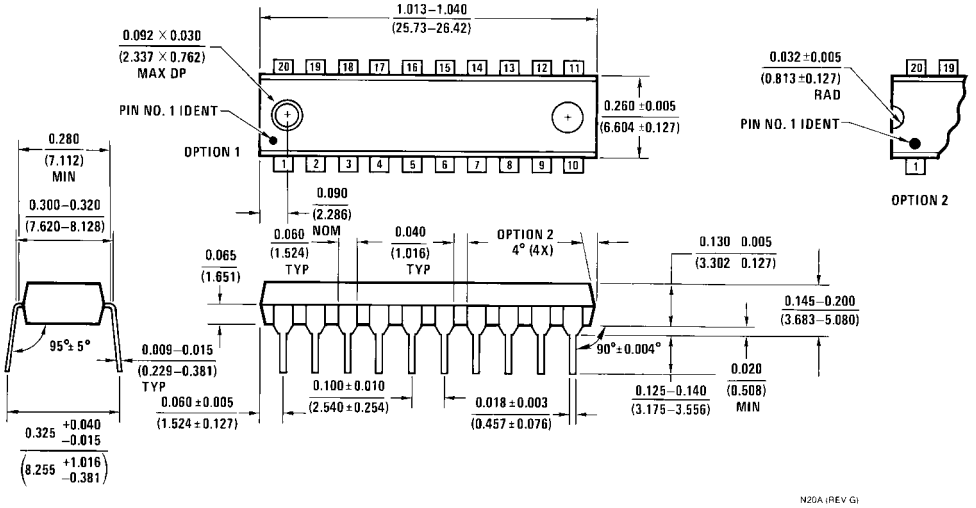
M20DRevB1




DETAIL A

**20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide**
**Package Number M20D**

## Physical Dimensions inches (millimeters) unless otherwise noted (Continued)




**20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide**
**Package Number N20A**

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